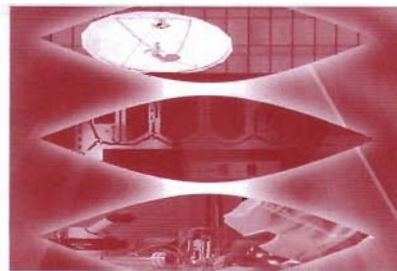


# INITIATIVE IN AFRICA

FOLLOWING THE SUCCESS OF ITS PROJECTS IN LATIN AMERICA, THE MILLENNIUM SCIENCE INITIATIVE (MSI) IS ABOUT TO LAUNCH A SERIES OF PROJECTS IN AFRICA DESIGNED TO BOOST THE CONTINENT'S CAPACITY IN THE BASIC SCIENCES. TWO MEMBERS OF THE MSI AFRICAN TASK FORCE EXPRESS GUARDED OPTIMISM FOR THE EFFORT.

**A**frican nations are emerging from decades of turmoil and brain drain that have weakened their institutions of higher education in general and science and technology in particular.



tiative are to nurture Africa's long-neglected human resources, provide support to keep Africa's finest young scientists at home, and rebuild the effectiveness of the continent's universities and laboratories.

These nations now recognize the urgent need for stronger science and technology (S&T) capacity if they are to take their places among modern nations and harness the power of knowledge to reduce disease, enhance food security and stimulate their economies.

Mohamed Hassan, president of the African Academy of Sciences (AAS) and executive director of the Third World Academy of Sciences (TWAS), has stated the matter in blunt terms: "Science alone cannot save Africa, but Africa without science cannot be saved."

Members of a scientific task force associated with the Millennium Science Initiative (MSI) first met more than three years ago with the intent to design a new programme to strengthen African S&T. The goals of this ini-

tiative's successful scientific capacity building ventures in Latin America, which first took shape in 1999 when MSI began organizing programmes in Brazil, Chile and Mexico – efforts that were financed by the World Bank and national governments.

For Africa, an African MSI task force was organized jointly by TWAS and the Science Initiative Group (SIG), an independent, international nongovernmental organization that advises the MSI. The activities of SIG have been underwritten by the Packard Foundation.

Members of the MSI Africa task force, including leading African scientists and educators, selected three priority areas:

- Biology and Biotechnology – because of their essen-

tial role in combating disease, building food capacity, and developing new products with market potential.

- Mathematics – the bedrock and language of all the other sciences, which has been intolerably weakened by neglect and under-funding in recent decades.
- Instrumentation and Information Technology (IIT) – because of their essential role in strengthening weak S&T infrastructure and permitting scientists to obtain quick access to current technical knowledge and regain lost intellectual ground.

MSI's strategy involves strengthening and linking the work of local researchers, teachers and programmes to activities and institutions that are already in place. As a result, MSI is an international initiative that depends directly on local know-how and commitment for success.

African scientists are all too familiar with programmes that have been prompted by well-intended individuals from outside the continent but that have failed to take root in local soil. The

current proposal follows a different approach: It is determined to strengthen local capacity in science and technology as a prerequisite to, instead of the endpoint of, development.

This approach rests on the understanding that local leaders best understand local needs and opportunities and have the best perspective on how to build Africa's scientific capacity over the long term. In this process, SIG acts as a catalyst, in collaboration with the World Bank, while the task force makes the substantive on-the-ground decisions.

Specifically, the purpose of the African MSI is to:

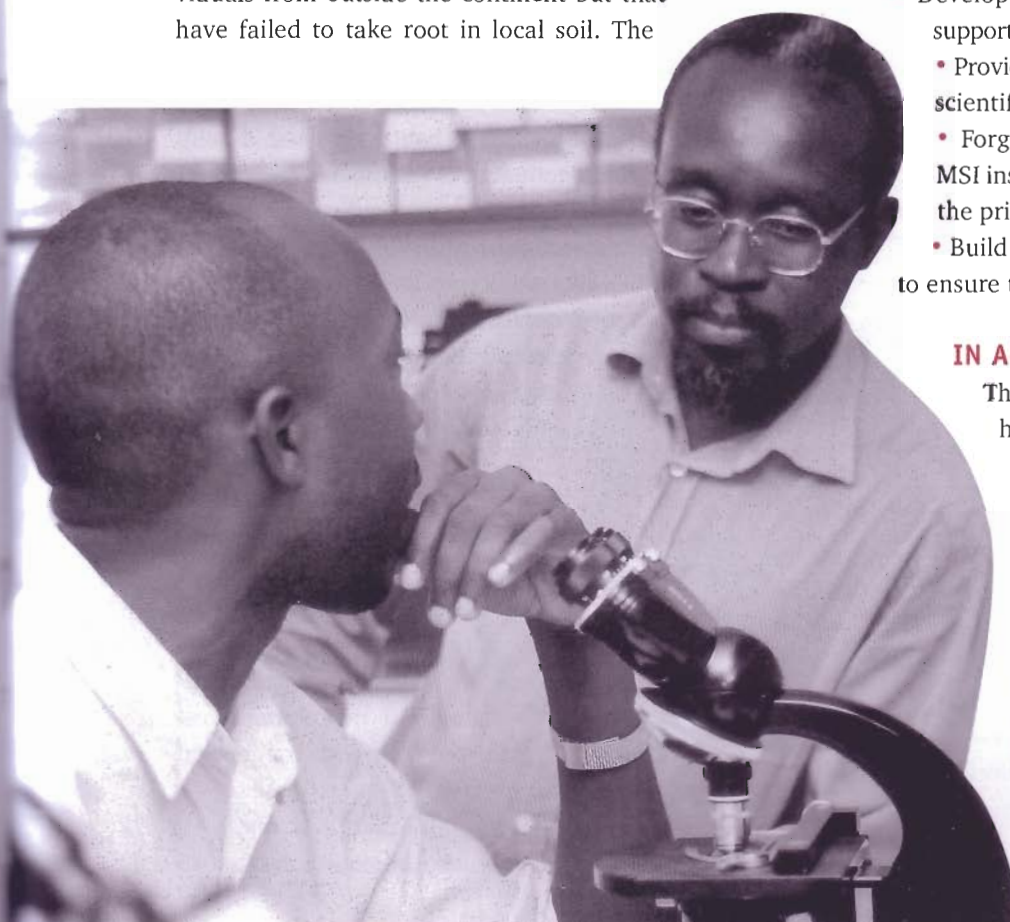
- Support small, flexible groups, 'MSI institutes', dedicated to scientific research and education.
- Work closely with government leaders to integrate scientific research into the country's development goals.
- Develop programmes of sufficient quality to support some of Africa's best scientists at home.
- Provide models of scientific education for the scientific leaders of tomorrow.
- Forge linkages and partnerships between MSI institutes, other research institutions and the private sector both in Africa and abroad.
- Build financial support for MSI programmes to ensure their long-term sustainability.

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## IN AFRICA

The three initial African MSI programmes have evolved from the recommendations and guidance provided by the original task force and are now being guided by independent groups of African scientists.

**Biology/Biotechnology.** The overriding mission of the biology/biotechnology programme is to advance African expertise in modern biology and its applications. The programme will seek to benefit from the synergies of four existing activities in



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### WHAT IS MSI?

Launched in 1998 with financial assistance from the World Bank, the Millennium Science Initiative (MSI) strives to build capacity in modern science and technology in developing countries. Through its flagship MSI institutes – competitively chosen programmes of excellence in scientific research and training – MSI helps to nurture a cultural and material environment that allows scientists and engineers from developing countries to engage in world-class research and training in their home countries. MSI topics vary widely from biotechnology and complex engineering systems to public health and microelectronics. To date, MSI institutes have been established in Brazil, Chile and Mexico, and have reached the implementation stage in Africa. The mission of MSI will soon be reinforced by the creation of the Global Science Corps, which will send scientists from developed countries to work with colleagues in the developing world. For additional information, see [www.msi-sig.org](http://www.msi-sig.org).



Botswana, Cameroon, Kenya and Uganda, directed by leading scientists in genomics, bioinformatics, chemistry and botany.

Principal programmatic goals, focusing on public health and food security, include strengthening genomic and post-genomic expertise to fight such endemic diseases as malaria, HIV/AIDS and tuberculosis at their genetic bases, and using the insights of biotechnology to increase crop production. In addition, the initiative hopes to develop strategies for screening and identifying plant products and develop marketable products.

MSI will help link these diverse components, leveraging their respective strengths and integrating them with regional programmes that traditionally work in isolation. Students will earn degrees with their home universities, study with invited experts, and spend periods at other MSI centres and institutions abroad.

The biotechnology effort is focused in Uganda and led by **Thomas Egwang** (TWAS Fellow 1997), director general of Med Biotech Laboratories in Kampala, Uganda, and co-author of this article. The biotechnology and bioinformatics effort is focused in Cameroon and led by Vincent Titanji, deputy vice-chancellor, University of Buea.

MSI efforts to help screen and identify plant products will be designed to fight disease, enhance health, and expand human food resources. In the longer term, the efforts will seek to develop products of commercial potential to stimulate local employment and increase exports. Screening of natural plant products will be led by Berhanu Abegaz (TWAS Fellow 1998) at the University of Botswana, where the emphasis will be on chemical analysis, and Keto Mshigeni (TWAS Fellow 1987) at the University of Namibia, where the emphasis will be on the identification and development of plant products with commercial potential.

We anticipate that the biology/biotechnology initiative will

result in an increasing number of university graduates with the skills to work in the health, agriculture and service industries, particularly those that promote knowledge-based products and services. Specifically, we anticipate that the initiative will help build the skills necessary for scientists to pursue research and development agreements with industry that ultimately lead to new patents and products. The overall goal is to improve the quality of research and teaching and reduce or even reverse the brain drain.

Viewed through the lens of long-term economic development and efforts to promote social equity, all of the elements of the biology/biotechnology initiative have been designed to contribute toward better public health and greater food security that directly aid the poor.

**Mathematics.** The task force unanimously recommended an MSI mathematics programme for three reasons: (1) the weakened state of university mathematics in Africa; (2) the fact that in recent decades, all science-based fields have come to depend on mathematical knowledge and techniques, most notably computer modelling, statistics, and data processing; and (3) the growing consensus among both scientists and policy makers that the quantitative sciences are spreading to fields beyond the sciences, including finance, business, transportation, law and even entertainment. The simple truth is that Africa must respond to this growing demand for mathematical expertise if it

is to acquire a sense of economic well-being and power in the world.

In 2003, a Writing Group for the African Mathematics MSI (AMMSI) completed a proposal for a multi-country initiative to address this challenge. Members of the planning group were drawn from Botswana, Cameroon, Kenya and Nigeria, and were assisted by mathematicians in South Africa, Sweden and the United States. This proposal was the subject of a broader workshop in Nairobi in June 2004, sponsored jointly by the African Academy of Sciences (AAS) and the International Mathematics Union (IMU), and supported by the Mellon Foundation and the Carnegie Corporation.

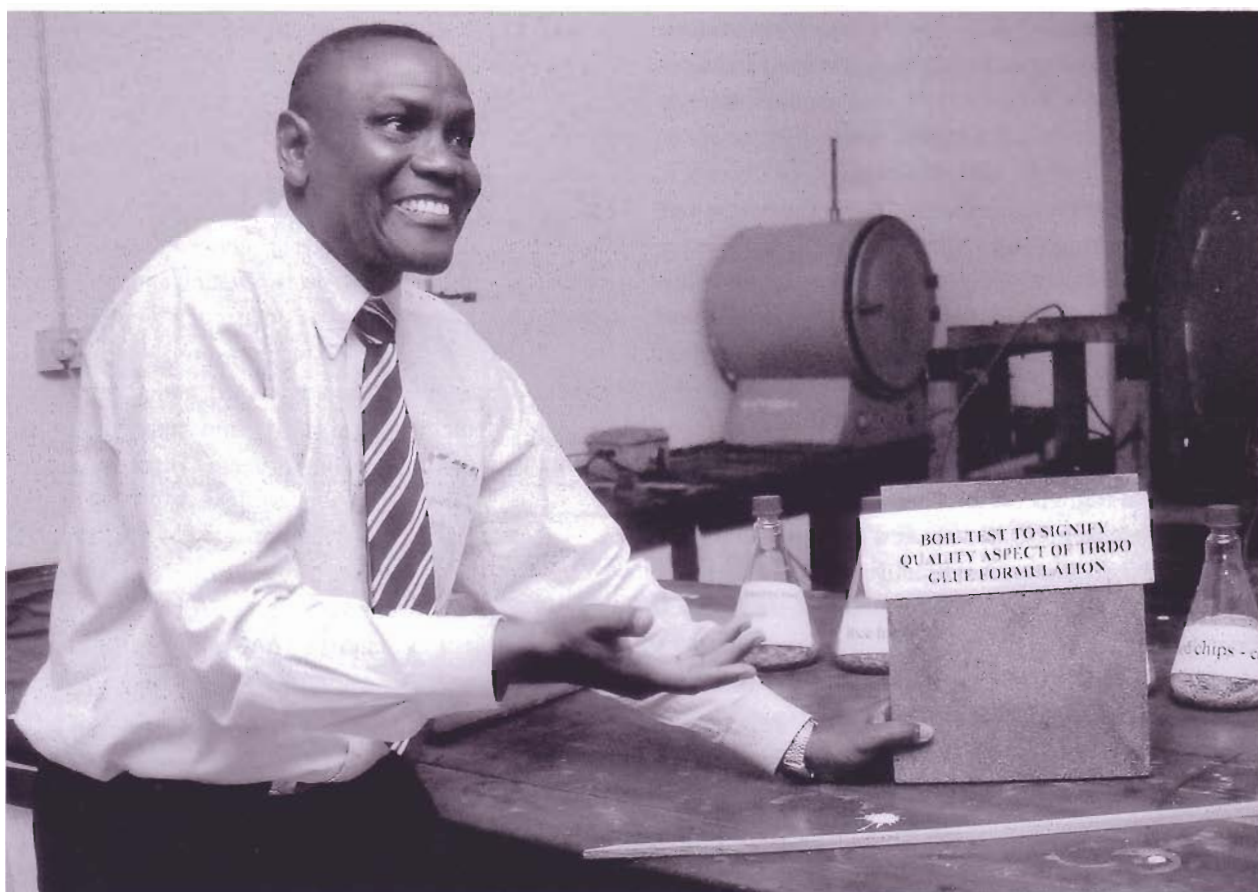
The significance of this workshop was illustrated by the stature of those in attendance, including the president of the African Academy of Sciences (AAS); current and past presidents of the African Mathematics Union (AMU); the secretary of the International Mathematics Union (IMU); and the general secretary of its Commission on Development and Exchanges (CDE), as well as leading mathematicians from the *Institut de Mathématiques et de Sciences Physiques*, Benin; National Mathematics Centre, Abuja, Nigeria; University of Botswana; University of Nairobi, Kenya; University of Western Cape and University of Stellenbosch, South Africa; and University of Yaoundé I, Cameroon.

Other organizations actively promoting mathematics in Africa were also represented, including TWAS; the *Centre International de Mathématique Pure et Appliqué*,

***The overall goal is to improve the quality of research and teaching and reduce or even reverse the brain drain.***

**AND WHAT IS SIG?**

*The Science Initiative Group (SIG) provides support and guidance to the Millennium Science Initiative (MSI). SIG is governed by a seven-member board that includes C.N.R. Rao, president of TWAS; Jacob Palis, secretary general of TWAS; and Mohamed H.A. Hassan, president of the African Academy of Sciences (AAS) and executive director of TWAS. Other board members are Phillip A. Griffiths (chair), professor, Institute for Advanced Study (IAS), Princeton, New Jersey, USA; J. Thomas Hexner, venture capitalist, Cambridge, Massachusetts, USA; Chung W. Kim, president, Korea Institute for Advanced Study (KIAS); and Harold Varmus, president, Memorial Sloan-Kettering Cancer Center, New York City, USA. SIG is administered by a small staff based at the IAS. Much of SIG's work has been supported by grants from the Lucile and David Packard Foundation. For additional information, see [www.msi-sig.org](http://www.msi-sig.org).*



France; the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy; the International Science Programme, Sweden; the United Nations Educational, Scientific and Cultural Organization (UNESCO); and the World Bank. The group not only brought broad experience and expertise in mathematics research and education but enthusiasm for revitalizing mathematics in Africa.

In addition to the African Mathematics MSI, a second programme of pan-African scope was well represented at the workshop – the African Institute for Mathematical Sciences (AIMS), which opened in autumn 2003 (see “AIMS For Africa,” pages 65-70).

AIMS is located in Cape Town, South Africa, where it trains students from all over Africa in a nine-month intensive postgraduate diploma course taught by outstanding African and international lecturers. Because the

goals of AMMSI and AIMS are essentially the same, the two groups signed an agreement to collaborate in building African mathematics capacity. While AMMSI planning was initiated in sub-Saharan Africa, it envisions strong ties to North African partners as well.

Workshop participants also agreed that because of the diminished number of mathematics leaders on the continent, a pan-African partnership would be the most effective instrument for building mathematics capacity. Members of this partnership, it was agreed, would benefit from working together as a ‘multi-centred’ centre of excellence in teaching and research under the New Partnership for African Development (NEPAD). As a result, participants agreed to jointly approach NEPAD to request designation as a NEPAD centre of excellence. A response to this request is expected in the near future.

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The organizations represented in Nairobi agreed to work together to build African mathematics in the following specific ways:

- Promoting education and research through the provision of funds for postgraduate and postdoctoral fellowships.
- Assisting young researchers in mathematics through the provision of funds for journals, books, computers, software and travel to professional meetings.
- Encouraging research through the award of prizes for young mathematicians.
- Providing links to colleagues and research groups both in Africa and throughout the world.
- Raising public awareness of the importance of mathematics to African nations.

**Instrumentation and Information Technology (IIT).**

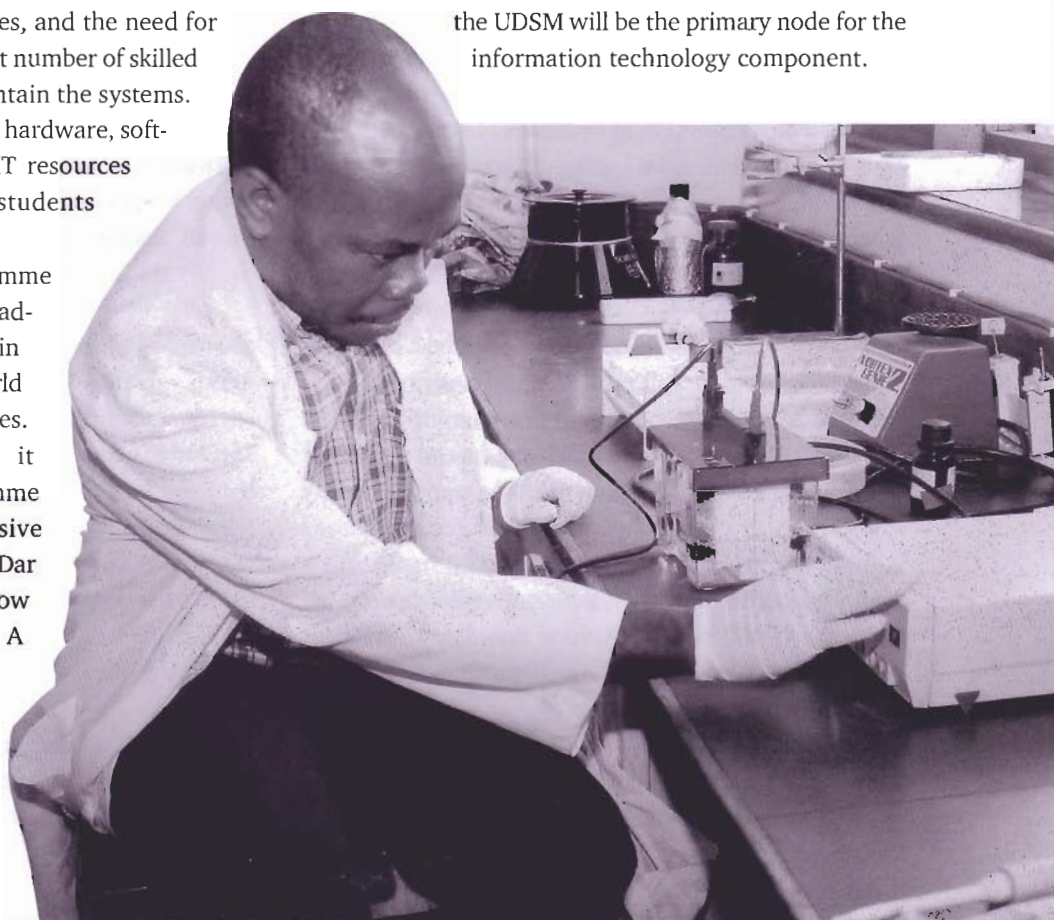
Stronger infrastructure in both advanced instrumentation and information technology have been priority areas for the African MSI since the earliest planning stages. Focus on these areas has been driven by two compelling factors: the need in most African universities for stronger technical infrastructures, and the need for training and retaining a sufficient number of skilled technicians to operate and maintain the systems. The effort is designed to provide hardware, software, training and access to IIT resources needed by scientists and students throughout Africa.

Initial interest in this programme was expressed by technology leaders in Tanzania. This interest, in turn, was discussed with the World Bank and government ministries. Following these discussions, it became clear that the programme must also solicit the extensive involvement of the University of Dar es Salaam (UDSM), which has now enthusiastically joined the effort. A meeting between SIG and university leaders in June 2004 and a larger stakeholders' meeting at the University of Dar es Salaam in July 2004 has led to a formal proposal

**CHILE FIRST**

*The Centro de Estudios Científicos (CECS, Centre for Scientific Studies) in Valdivia, Chile, was one of the first research institutes funded under the Millennium Science Initiative (MSI). Despite being located far from the Chilean capital, Santiago, CECS receives visits from students and scientists from all over the world interested in its specialist fields of biophysics and molecular physiology, theoretical physics, and glaciology and climate change. The institute, which also plays host to several international conferences each year, is headed by Claudio Teitelboim (TWAS Fellow 1991), a renowned expert in quantum black holes physics and the theory of gauge systems. For additional information, see [www.mideplan.cl/milenio.htm](http://www.mideplan.cl/milenio.htm).*

for funding. The Tanzania Industrial Research and Development Organization (TIRDO) will be the primary 'node' for the instrumentation component, while the UDSM will be the primary node for the information technology component.



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The IIT initiative has five inter-related objectives:

- Expand the capacity for training and retaining technicians at institutions of higher learning;
- Educate more masters- and PhD-level students who would like to do research in IIT and educate others;
- Train scientists and engineers who would like to use advanced instrumentation;
- Provide access to advanced equipment for use by scientists and engineers from academia, government and industry;
- Offer consulting services and outreach in IIT to industry.

The over-arching goal of the IIT initiative is to nurture abilities that are marketable, competitive and usable both by educational institutions and by the private sector. To advance this goal, the programme will support undergraduate and graduate students in IIT fields through scholarships, internships and personnel exchanges. The College of Engineering at the UDSM, for example, describes an urgent need to support more graduate students pursuing the MSc degrees both in computer engineering and information technology. The faculty has few students in this area because students have to raise their own tuition. Tanzania, like many African nations, urgently needs more students trained in software engineering, network management and web-based education.

## ROAD AHEAD

The time is right for an African MSI for several reasons.

First, it is clear that science and technology must be the capstone of a broad-based educational system if African nations are to take their place among modern nations.

Second, the political climate for investments in science and science-based development is more favourable today than it has been for several decades. As a result, governments have taken a direct hand in helping to shape science-based economic reforms and in providing funds and other policy incentives to make the reforms happen. For example, the government of Tanzania has recently repealed a surtax on all computer products and liberalized restrictive telecommunications laws. Such

reforms have also included reassessments of the role of universities in society.

Third, international funding organizations have expressed a deep interest in helping to build scientific capacity in Africa. The World Bank, for example, has recently developed its own science and technology strategy to complement its emphasis on support for education.

We firmly believe that the ability of Africans to take hold of their own destiny must begin with a local knowledge revolution – and that this revolution must begin quickly.

By good fortune, new information and communication technologies can assist distance learning and provide the means for young Africans to gain access to the latest knowledge, even in remote areas. In short, thanks to the revolution in information and communication technologies, Africans now have the means to regain lost ground and retain more of their brightest young scientists and engineers to work at home.

Our vision today is for a strengthened and truly liberated Africa, led by a new generation of science-savvy young Africans who are equipped with the knowledge and tools they need to leapfrog into the 21<sup>st</sup> century. ■

***The goal of the initiative is to nurture abilities that are usable by both educational institutions and the private sector.***

◆ **Thomas Egwang**

*TWAS Fellow 1997*

*Howard Hughes International Fellow*

*Director, Med Biotech Laboratories*

*Kampala, Uganda*

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*Both authors serve on the African MSI Task Force*